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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to a Foraminous Plastics Seat Member

I, SAMUEL PEACE CRANE, a citizen of the United States of America, residing at 23 Pine Drive, Great Neck, State of New York, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a foraminous sheet suitable for use in a ventilated seat member; and to cushions, for instance for use on automobile seats, made from such sheets.

It is an object of the invention to provide an inexpensive, durable ventilated cushion or spacer. Such seat material should be dimensionally stable but should be sufficiently flexible to adjust itself, under load, to the shape of its supporting surface, such as an automobile seat, and rigid enough when used as a seat to give comfortable support to the user.

The sheet according to the invention is formed from a single flat sheet of synthetic plastics material and comprises a generally planar one-piece net-like web having rows of ventilation apertures formed therethrough, and a plurality of elements lying out of the plane of the web and joined integrally therewith and each bridging one of the apertures, the tops of the elements together forming a load-bearing surface, the apertures being arranged in rows which run in the direction of the long axes of the elements, whereby a series of continuous strips of the web remain imperforate between the apertures, and the strips being parallel to and spaced from each other and adapted to stiffen the web.

This sheet is of relatively great overall height in comparison with the thickness of the web material. The arches can be capable of supporting considerable load, whilst the sheet can be made resilient enough to serve as a cushion.

A seat cushion or spacer made of such a sheet may have an integral substantially imperforate marginal portion which may include a reinforcement against undue distortion. Such cushion may also include a strip of anti-slip material woven therein.

The invention will be described in detail with reference to the accompanying drawings, in which:—

Fig. 1 is a fragmentary perspective view of an expanded fabricated sheet or molded member, some of the outstanding arched elements being omitted to show more clearly the ventilating openings and the integral imperforate rows of netlike cross bracing strips, which create a foraminous member.

Fig. 2 is a fragmentary top plan view of a ventilating spacer utilizing the member of Fig. 1 and showing the marginal reinforcement as well as the under friction or anti-slip strips woven into the elements.

Fig. 3 is a vertical sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary top plan view of a modified form of the expanded member.

Fig. 5 is a vertical sectional view taken on the line 5—5 of Fig. 4.

Fig. 6 is a fragmentary top plan view of another form of the arch-like elements of the member, showing an integral strengthening rib therein.

Fig. 7 is a plan view of half of a modified form of the cushion or spacer, in which the arch-like elements are arranged in a series of concentric circles instead of parallel rows, the other half being the same as that shown.

Fig. 8 is a plan view of a cushion or spacer in which the arch-like elements alternate and in which the seat part and back part are made from a single sheet and are

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normally held in a coplanar position by strip springs loosely woven into the sides of the cushion.

Fig. 9 is a fragmentary vertical sectional view taken on the line 9—9 of Fig. 8.

Fig. 10 is a similar view of the same showing a modified form of the marginal reinforcement.

Fig. 11 is a similar view of the same showing another form of the marginal reinforcement.

Fig. 12 is a fragmentary plan view of a cushion or spacer similar to that of Fig. 8, but showing the back and seat parts as separate pieces held together adjustably by the side springs which are wedged into adjusted positions.

Fig. 13 is a fragmentary vertical sectional view taken on the lines 13—13 of Fig. 12.

As has been indicated, the fabricated member shown in Fig. 1 has various uses and may be made of various synthetic plastics materials having the characteristics required for special uses. It may also be made by various processes such as shaping a relatively thin sheet of uniform thickness by heat and pressure between suitable dies or by molding or the like. When fabricated from a sheet, selected areas between discontinuous slits ar pressed laterally out of the initial plane of the sheet into the outstanding generally arch-shaped elements desired, while permitting linear bracing portions to remain unchanged and thereby to produce a foraminous or net-like member having openings therein bridged by the elements. When expanded to a considerable extent, parts of the elements may decrease in thickness by the excessive lengthening thereof, but such decrease is compensated for by curving the element material, impressing a rib thereinto or otherwise shaping the parts of the element to increase its strength. When made by molding processes, the parts which take the greatest stresses are obviously made thickest. In what follows, the expanded member as well as the articles made therefrom, will be described as though the outstanding elements thereof were made from a sheet, though it will be understood that other appropriate processes may be utilized to attain substantially the same form of the expanded member.

In the form shown in Fig. 1, a series of longitudinally aligned separated slits as 16 are arranged in a row along a straight line. A similar but opposed series of companion slits 16*a* parallel to and spaced transversely away from the slits 16 are made in the sheet. The material forced laterally or outwardly from between the companion slits and out of the initial plane of the sheet is shaped as desired, which is preferably in the general form of a trapezoidal arch to form a supporting element bridging the resulting opening in the sheet. As shown, the element has a flat top 17 parallel to the plane of the sheet, and sloping sides 18 and 19 of substantial height. The flat tops provide discontinuous bearing areas for the support of the load, and are close enough for a user to sit on or lean against without discomfort when the member 15 is incorporated into a ventilating cushion or spacer.

The openings, formed between companion pairs of slits 16 and 16*a* by the removal or displacement of material to form the elements, are in spaced relation to each other, being separated by the imperforate bracing strips 22 extending lengthwise of the openings 20 completely across the member. Said openings 20 communicate with the spaces in the elements to permit the circulation through the member of enough air to adequately ventilate the member, while the bracing strips resist bending on lines extending between the ends of adjacent openings thereby avoiding objectionable limpness or distortion of the member in one direction. To stiffen the member as well against bending in a perpendicular direction and thereby to form a net-like area of substantial extent, the slits 16 of each row of such slits, as well as the slits 16*a* of the companion row, are spaced apart longitudinally so that a substantial area of imperforate material separates the ends of the slits in each row of the entire set of such rows. Such imperforate areas merge into bracing strips 23 extending completely along the member and form a set intersecting the set of strips 22.

It will be understood that the shapes and sizes of the slits, openings and outstanding elements may be varied to a considerable extent. In Figs. 1—3, the elements alternate in arrangement in a single row to form a set extending upwardly from the general plane of the connecting bracing strips 22 and 23 and a second set in the same rows extending downwardly. The first set constitutes the crests 24 and the alternate set constitutes the troughs 25. Such crests and troughs also alternate in the transverse set of rows parallel to the bracing strips 23. As a result, the overall thickness of the member 15 is considerable. It is due to the foraminous structure of the member that it is adequately ventilated without sacrifice of its suporting properties and while permitting some flevibility in the member even though it may be made of relatively rigid plastic.

When the plastic used is of greater resiliency than that required for seat ventilators, the member may be employed in shipping packages as a protecting packing cushion, or for other cushioning pur-

poses where a resilient supporting pad is desirable.

In Figs. 4 and 5 is shown a member 26 in which only outstanding crests are provided as elements, the troughs having been omitted in order to attain denser or more closely spaced bearing areas than would be possible if the troughs were present. The arch-shaped crests are aligned in rows lengthwise of the openings 20 similarly to those shown in Figs. 1—3, but the crests differ in arrangement, those of Figs. 4—5 having adjacent rows which are relatively staggered. The transverse bracing strips 28 between the ends of adjacent elements in each row consequently are not continuous or straight, but are undulating. In addition, or optionally, the converging outstanding sides 29, 30 of the elements are curved in cross section so as better to resist bending or collapse under load than when flat.

In the form of the element shown in Fig. 6, all three sides are provided with suitable outstanding ribs as 31 to strengthen said sides, it being understood that such ribs may be provided, if desired, in any of the elements hereinbefore described.

The expanded plastic member, no matter how it is fabricated, is particularly useful in a ventilating cushion or spacer for an automobile seat. For such use, the marginal portion 33 of the sheet (Figs. 2 and 3) preferably remains imperforate for stiffening purposes and may be additionally reinforced or stiffened in a number of ways. In Figs. 2 and 3, the peripheral portion 34 is curved underneath and around the preferably plastic welt or core 35 and heat sealed to the marginal portion 33.

In Fig. 7, the outstanding elements are arranged on concentric circles as 36, 37 to form a disc-shaped cushion or spacer, leaving concentric bracing strips 39 between the concentric circles of elements. It will be understood that the arrangement of the rows of elements does not necessarily depend on the outline of the shape selected for the cushion, provided that at least two sets of intersecting bracing strips separate and stiffen the elements and the member. As shown in Fig. 7, radial bracing strips 38 remain between adjacent radial rows of the elements. The curved marginal flange 40 serves to retain the border stiffening member 41 in place.

In Fig. 8 is illustrated the application of the member as 15 or the like to a generally rectangular one-piece seat cushion or spacer having a seat part 42 and a back part 43 integral therewith. The area 44 between said parts remains imperforate. Through the side marginal portions 45, 46 short transverse spaced apart slits are made as 47, through which suitable flat springs as 49 (Fig. 9) are woven. The springs are normally flat spring strips shaped to maintain the parts in coplanar positions when unloaded and unstressed, but are soft enough to yield readily and to permit the parts to assume mutually perpendicular positions whereby the seat part may be arranged to rest on the seat cushion of an automobile and the back part against the back cushion. The edges of the cushion or spacer, regardless of the shape of its outline or of the shape or arrangement of the rows of outstanding elements thereof, terminate in outstanding flanges as 50 substantially perpendicular to the general plane of the expanded member and serves as a means for stiffening the cushion against undue bending and aiding the longitudinal and transverse bracing strips between the elements to attain the required resistance to bending.

In Fig. 10, the edge stiffening means takes the form of an inturned springy cylindrical edge portion 51 enclosing a socket-like space 52 having a flared lip 53 constricting the entrance opening to said space and adapted to receive the border frame 54 of suitable stiffening material. The frame is forced past the lip, which yields to enlarge the entrance opening and to permit the frame to move therepast and into the furthermost part of the socket 52, the lip being released and again restricting the opening after the passage of the frame therepast.

As shown in Fig. 11, the edge reinforcing or stiffening means comprises corrugations or ribs as 55 in the marginal portion of the cushion, optionally combined with the outstanding flange 56.

Should it be desired to have separate seat and back parts for the cushion, as shown in Figs. 12 and 13, such parts are adjustably connected by the flat springs 49 woven through the slits 47 of said parts as in Figs. 8 and 9. The seat and back parts are slid along the springs until the space 57 therebetween is adjusted to the required width, thereafter the springs are secured to the parts in any suitable manner as by wedging them into the slits, or by snap fasteners or the like. Wedges as 58 are shown diagrammatically in Fig. 13 to prevent undesired movement of the seat and back parts relatively to each other and to the springs.

To resist slippage of the cushion on its seat, suitable anti-friction (such as rubber) strips as 60 (Figs. 2 and 3) are woven through the spaces in the elements in position to contact the seat on which the cushion rests. In the form of Figs. 4 and 5 the strips may be woven through the openings 20 in a similar manner.

It will now be seen that the expanded member herein described may assume a variety of forms by the proper spacing sizes and arrangements of the elements, openings and bracing strips thereof; that such mem-

ber has various uses and may be made of various plastics by various processes depending on the type of load thereon and the desired rigidity strength flexibility and resilience thereof, that when used in cushions, such cushions are made in any desired shape of a single piece of plastic other than the edge reinforcing means added thereto, that adequate provision is made for ventilation through the openings and communicating spaces in the member and that the various objects of the invention have been adequately attained.

WHAT WE CLAIM IS:—

1. A foraminous sheet suitable for use in a ventilated seat member, which is formed from a single flat sheet of synthetic plastics material, and comprises a generally planar one-piece net-like web having rows of ventilation apertures formed therethrough, and a plurality of elements lying out of the plane of the web and joined integrally therewith and each bridging one of the apertures, the tops of the elements together forming a load-bearing surface, the apertures being arranged in rows which run in the direction of the long axes of the elements, whereby a series of continuous strips of the web remain imperforate between the apertures, and the strips being parallel to and spaced from each other and adapted to stiffen the web.

2. A sheet according to claim 1, which is formed by pressing the elements out of the plane of the sheet to produce the apertures therein.

3. A sheet according to claim 1 or 2, wherein the apertures are also arranged in ranks which run transversely to the first-mentioned rows.

4. A sheet according to claim 3, wherein the apertures of one row are staggered relative to the apertures of the adjacent row.

5. A sheet according to claim 3, wherein the apertures of each row are in line with those of the adjacent row, whereby a second series of continuous stiffening strips is formed transversely to the first series and in the direction of the ranks of apertures.

6. A sheet according to any preceding claim, wherein the arch-like elements project alternately laterally in one direction and in the opposite direction with respect to the plane of the web.

7. A sheet according to any preceding claim, wherein the top of each element is of slightly less length than and of substantially the same width as that of the opening which it bridges.

8. A sheet according to claim 7, wherein the sides of each element are of lesser thickness than that of the web.

9. A sheet according to any preceding claim, wherein the top of each element is flat.

10. A seat cushion which comprises a sheet according to any preceding claim, wherein the web is extended peripherally to form an imperforate stiffening border.

11. A seat cushion according to claim 10, wherein the edge of the border is recurved to hold a reinforcing member.

12. A seat cushion according to claim 10 or 11, which includes a strip of anti-slip material woven through a selected row of apertures so that selected portions thereof are exposed to form anti-slipping surfaces.

13. A cushion according to claim 12, wherein the non-slip material is a flat strip of an elastomer such as rubber.

14. A cushion according to any of claims 10 to 13, which comprises a seat part and back part separated by an imperforate hinge portion integral with the seat and back parts, springs being woven through the margins of the parts at a desired angle.

15. A cushion which comprises two cushions according to any of claims 11 to 14, joined by springs woven through the margins of the parts to hold them together.

16. A foraminous sheet or seat cushion, substantially as hereinbefore described with reference to, or as shown in the accompanying drawings.

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1 SHEET

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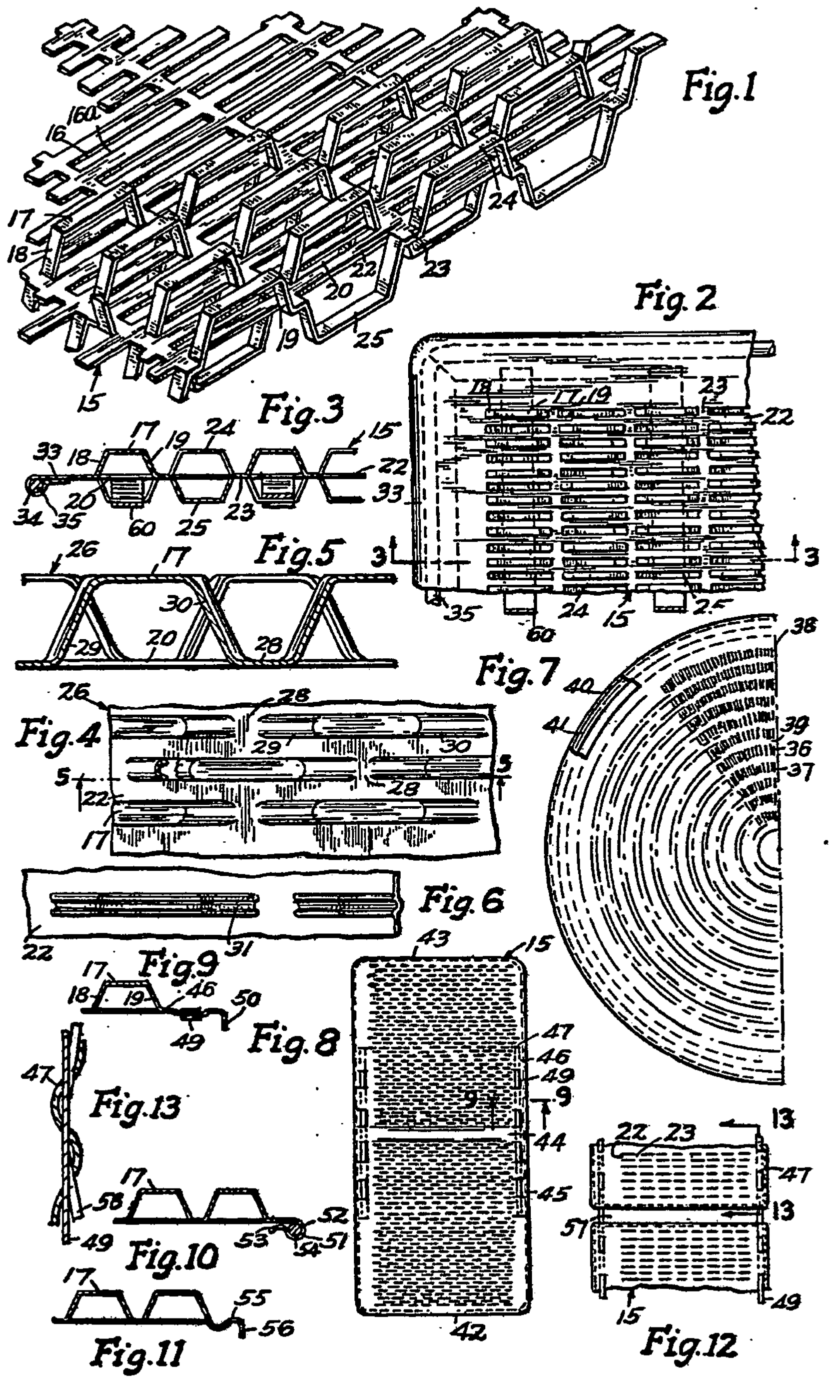

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